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The Dental School Applicant Pool and the Oral Healthcare Workforce

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The Dental School Applicant Pool and its Impact on the Oral Health Workforce

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Executive Summary

A. Preface

One of the major challenges faced by the dental profession today is the recruitment of the most qualified dental school applicants who are capable of serving the nation's future oral healthcare needs. The Association of Schools of Public Health (ASPH)[1] also recognizes this challenge, describing one of the three core functions of public health as "assuring that all populations have access to appropriate and cost-effective care, including health promotion and disease prevention services." To achieve this core function, the ASPH cites "a competent public health and personal healthcare workforce" as one of the ten essential public health services. Unfortunately, the goals of both quality and equality in terms of the dental workforce and access to oral healthcare have yet to be realized.

When considering access to oral health services on a national or state level, a thoughtful and thorough consideration of the dental school applicant pool is essential. According to a recent study published in the Journal of the American Dental Association, the annual number of retiring dentists will exceed the number of newly licensed dental practitioners in 2009, a trend which is projected to continue throughout the next decade.[2] The approximately 4,400 dentists produced each year from the nation's 57 accredited dental education programs are charged with the responsibility of meeting the oral healthcare needs of the population at large.[3]

B. Introduction

The dental school applicant pool represents the future of the dental profession. An understanding of the dynamics of the dental workforce begins with an understanding of the undergraduate colleges and universities that are producing students interested in pursing dentistry as a career. An insight into the predental enrichment activities of such undergraduate institutions, as well as an understanding of the academic and nonacademic characteristics of dental school applicants is necessary, yet has not been well researched. This information may be useful for states or geographic regions interested in increasing the size of the dental workforce or for areas with the goal of maintaining an adequate number of oral healthcare providers.

The relationship between the dental school applicant pool and the dental workforce is also poorly understood. The dental school applicants of today represent the oral health workforce of tomorrow. Although the number of dentists nationwide may be sufficient to meet the oral health demands of Americans, the workforce is not adequately distributed to serve the needs of the population. According to the United States Health Resources and Services Administration (HRSA), as of September 2008 there were a total of 4,048 areas designated as Dental Health Professional Shortage Areas (HPSAs) where there is less than one provider per 3,000 people.[4] A total of 48 million people live in these geographic Dental HSPAs, and a total of nearly 9,500 practitioners are needed to improve the status of these areas.

In order to better understand the relationship between dental school applicants and the workforce four research projects were conducted.[5,6,7,8] These studies represent the first examination of undergraduate colleges and universities that supply applicants to

dental schools, as well as the first in-depth investigation into the characteristics of students interested in pursing dentistry as a career. Finally, an analysis and examination of the relationship between a state's dental school applicants, total population, and dental workforce distribution is the primary focus of the final article. This information provides the foundation for the development of future interventions aimed at addressing inadequacies in the distribution as well as demographics of the oral health workforce.

C. Published Works

1. Characteristics of Dental School Feeder Institutions[5]

The purpose of this study was to facilitate enrollment and recruitment strategies by identifying and characterizing feeder colleges and universities that are the major source of applicants to U.S. dental schools.

Feeder school information was obtained from The Associated American Dental Schools Application Service (AADSAS) for the 2002-2003 admissions cycle. The reports identified the degree status, institution and demographic information of each applicant. Feeder schools were defined as any school with 5 or more applicants. Minority-feeder schools were those with 2 or more applicants. Schools were ranked based on the total number of applicants (Category 1) and, to minimize the effects of school size, the applicant to total undergraduate enrollment ratio (Category 2). The top 50 feeder schools in both categories were compared using total school enrollment, degree status, geographic distribution, religious affiliation, and numbers of minority applicants.

At the time of application 6,947 dental applicants reported attending 1,149 colleges and universities. The top 50 Category 1 schools had average enrollments of over 19,000 while Category 2 schools had average enrollments of 8000 students. California

and Utah had the greatest number of applicants followed by Florida and New York, all together accounting for 28% of total applicants. Seventeen of the top 25 Category 2 schools had religious affiliations, including the Seventh-day Adventist Church with 6 institutions followed by Roman Catholic (3), Methodist (3), Mormon (3), Lutheran (1) and Jewish (1). The majority of black and Hispanic applicants attended schools in the southeast (Florida, Tennessee, Louisiana), Puerto Rico and California.

Results from this study indicate that the majority of dental school applicants are from colleges and universities with large student enrollments. However, many smaller schools, often affiliated with religious groups, have better applicant to enrollment ratios than larger institutions. Overall- and Hispanic- feeder schools are concentrated in heavily populated states while black-feeder schools are more regional. The majority of total applicants attended institutions in the Southwest region; minority applicants were concentrated in the Southeast.

2. Predental Enrichment Activities of U.S. Colleges and Universities[6]

The purpose of this study was to examine pre-dental enrichment activities and their impact on the number of applicants from the nation's top dental school feeder institutions (DSFI).

The DSFI were identified by their total number of applicants to dental schools and by their number of applicants per total student enrollment. A survey consisting of 25 yes/no questions on possible pre-dental enrichment activities was administered by phone or sent by e-mail to the top 88 DSFI, with 49 responding. Pearson correlation coefficients were used to measure the relationships among the number of applicants, pre-dental activities, and total student enrollment per institution.

The total number of applicants/institution was correlated with the total student enrollment/institution (r=.529) and the number of pre-dental activities/institution (r=.520). No correlation was observed between the number of activities at an institution and applicants per thousand enrolled. The percentages of DSFI with specific enrichment activities were: pre-professional health advising programs (96%), dental clubs (88%), volunteer programs (73%), specific pre-dental advising (69%), practice interview sessions (61%), shadowing program (59%), personal statement workshops (53%), committee for letters of recommendation (49%), clinical observation program (45%), oral health outreach to elementary/middle schools (39%), on-campus dental care facilities (37%), dentistry overview/introduction course (31%), DAT review course (27%), pre-dental honors society (20%), affiliated dental school (20%), ASDA chapter (18%), special interest/minority dental group (16%), scholarships for pre-dental students (10%), combined degree program (10%), and pre-dentistry as a major (6%). Sixteen of the DSFI reported 10 or more enrichment activities.

While larger institutions produced more applicants and had more activities, there was no correlation between the number of applicants per 1,000 students enrolled and the number of enrichment activities at an institution. The two activities most common to the top feeder institutions were a pre-professional health advising program and a dental club. Results indicate that there are specific pre-dental enrichment activities common to the top dental school feeder institutions in the United States, and that a better understanding of these may assist non-feeder schools in developing or strengthening an interest in dentistry as a career option.

3. Non-Academic Characteristics of Dental School Applicants[7]

Non-academic factors are used by dental schools in selecting qualified, well-rounded students. The purpose of this study was to evaluate shadowing experiences, and extracurricular, volunteer, and research activities of the average dental school applicant.

A database containing demographic, academic, and non-academic information for 1,116 applicants to the University of Connecticut School of Dental Medicine (UCSDM) 2005 entering class was generated using AASDAS Client and responses to AADSAS application questions. Quantitative and qualitative aspects of non-academic activities were assessed to generate a profile of the typical applicant. The data was analyzed using basic descriptive and inferential statistics without the use of applicant identification information.

The average GPA of the applicant pool was 3.23 with a DAT Academic Average of 18.55. Approximately 22% of the applicant pool reported working an average of 2270 hours as an assistant or hygienist. Of the remaining applicants, 86% reported an average of 172 shadowing hours with the majority (79%) in a general dentist office. Applicants participated in an average of: 3.7 extracurricular activities with 30% relating to arts/culture; 3.2 volunteer experiences with 35% directed towards public health; and 0.8 research projects with 80% involving biology. With the exception of shadowing, increased participation in any single non-academic area (extracurricular, volunteer, or research) resulted in similar increases for other two ($p \leq .01$). As hours of shadowing increased, GPA declined. Nearly half (48%) of the applicants participated in three of the major non-academic areas; 42% in four. While academically similar, women reported

significantly greater ($p < .05$) participation in all four non-academic areas when compared to their male counterparts.

Results from this study suggest that the average dental school applicant participates in three or four major non-academic areas. The typical applicant reported a combined total of approximately eight extracurricular, volunteer, and research endeavors and 170 or more hours of shadowing. Participation in non-academic areas was correlated, with the exception of shadowing, as an increase in any one area resulted in similar increases in the other two. However, shadowing hours were negatively correlated with average GPA. In general, women were more active across all of the non-academic areas when compared to men. These results can assist admissions committees in making qualitative comparisons between applicants with similar academic qualifications and aid health career counselors in advising pre-dental students.

4. Dental School Applicants by State and Workforce Distribution[8]

Millions of Americans face significant barriers that limit their access to oral healthcare. While many factors can affect access to care, the quality and quantity of a state's dental school applicant pool may also influence the ability to provide or maintain an adequate dental workforce. The purpose of this study was to evaluate the distribution of dental school applicants and dentists by state.

Dental school applicant data by state was provided by AADSAS and direct (non-AADSAS) applications for the 2005 Admissions Cycle. Workforce distribution and population profiles were obtained from the ADA Survey Center or the U.S. Census Bureau. States were ranked based on applicant : population, dentist : population, and applicant : dentist ratios. State results were compared to national averages and

categorized to identify applicant or workforce shortages. Data was analyzed using basic descriptive and inferential statistics.

Strong positive correlations existed between a state's total applicants and population (r = .958), applicants and dentists (r = .934), and dentists and population (r = .968). Based on the national average dentist : population ratio (1:1851), twenty states had a better overall ratio (1:1622) representing a combined surplus of 15,800 dentists; the remaining 30 states had a ratio of 1:2316. When comparing a state's total applicants or dentists to population ratios, 9 states had both ratios better than the national averages (Category 1), 11 states had better dentist : population but worse applicant : population ratios (Category 2), 13 states had better applicant : population but worse dentist : population ratios (Category 3), and for 17 states both ratios were worse (Category 4). Many of the Category 4 states were clustered in the Southeast and South Central regions.

Based on national averages, many states had too few dentists to meet state population needs. In addition, many of these same states had too few applicants when compared to state population figures. States may wish to consider targeted initiatives aimed at increasing the sizes of their dental school applicant pools in order to address local and regional dental workforce shortages.

D. Conclusions

It is evident that a majority of applicants to U.S. dental schools are the products of relatively few colleges and universities. Although large schools tend to supply higher numbers of applicants, there are some small institutions that produce high proportions of dental school applicants when compared to their student body sizes. This suggests that there are some undergraduate institutions that are very effective in promoting and

fostering an interest in dentistry as a career.[5] A survey of the most successful feeder institutions revealed that these schools have a number of common predental enrichment activities, specifically preprofessional health advising, dental societies, and oral health volunteer programs.[6] The typical dental school applicant participates in about eight extracurricular, volunteer, and/or research experiences while accumulating an average of 170 hours shadowing a dental professional.[7]

When considering the adequacy of the oral health workforce, it is important to consider the undergraduate colleges and institutions that supply applicants to dental schools as well as the nonacademic qualities that define such students. As these dental school applicants represent potential dental professionals, their quality and quantity has a direct impact on the dental workforce. It may prove useful to target students at the undergraduate level when developing strategies aimed at increasing the oral health workforce in a particular state or region.

A consideration of the geographical distribution of the dental workforce and the dental applicant pool may also be indicated. It appears that many states do not have an adequate number of dentists to meet current and future state population needs.[8] Many of these same states also have very few dental school applicants when compared to overall population and dental workforce figures. In these instances, initiatives aimed at increasing the size of the dental applicant pools may be utilized to address local and regional dental provider shortages. The establishment of self-sustaining, predental programs modeled after successful feeder institutions may prove to be an important means of promoting interest in the dental profession and the ensuring the adequacy of the oral health workforce.

E. Epilogue

An adequate supply of competent, well-trained, and culturally sensitive dentists is essential to meet the needs of America's public and private oral healthcare sectors. A thorough understanding of the dental school applicant pool is one of the first steps in ensuring the quality, quantity, and diversity of the oral healthcare workforce. It is important to consider what attracts potential oral health workers to the field and use this information in efforts to support a competitive applicant pool that can meet the future technological, scientific, and public health needs of the population.

The research presented in this thesis attempted to characterize the most successful feeder institutions and their prospective dental school applicants. In addition, the dental school applicant pool was compared to state population and dental workforce estimates. It is hoped that information from these studies will provide a solid foundation for better appreciating the importance of the applicant pool and its impact on the future of the dental workforce.

Appendix A: Journal of Dental Education Publications

- Characteristics of Dental School Feeder Institutions
- Pre-Dental Enrichment Activities of U.S. Colleges and Universities
- Nonacademic Characteristics of Dental School Applicants
- Dental School Applicants by State Compared to Population and Dentist Workforce Distribution

Characteristics of Dental School Feeder Institutions

Edward A. Thibodeau, D.M.D., Ph.D.; Lauren E. Mentasti

Abstract: A major challenge faced by all dental schools is the need to attract highly qualified student applicants. The purpose of this study was to use 2002-03 AADSAS data to identify and characterize feeder colleges and universities that are the major source of applicants to U.S. dental schools. Feeder schools were defined as any institutions with five or more applicants, and minority-feeder schools as those with two or more minority applicants. Feeder schools were ranked by their total numbers of applicants (Category 1) and by their ratio of applicants to total undergraduate enrollment (Category 2). Feeder institutions were compared using total enrollment, degree status, geographic distribution, religious affiliation, numbers of minority applicants, and college admissions selectivity criteria. The top fifty Category 1 schools had an average enrollment of over 19,000 students and an average of sixty-seven applicants. The top fifty Category 2 schools had an average enrollment of approximately 8,500 students and an average of forty-nine applicants. Less than 1 percent of applicants from the top feeder institutions attended the nation's most competitive schools. California and Utah accounted for 28 percent of the total applicants from feeder institutions, followed by Florida (6.2 percent) and New York (5.7 percent). Seventeen of the top twenty-five Category 2 schools (68 percent) were affiliated with or had student bodies associated with a particular religion, with the Seventh-Day Adventist and Mormon institutions accounting for 544 applicants. The majority of all applicants from feeder institutions attended schools in the Southwest. The majority of black and Hispanic feeder institutions were in Florida, Tennessee, Louisiana, and Puerto Rico. Results suggest that factors such as school size, geographic location, religious affiliation, and admissions selectivity criteria of colleges and universities may have a direct impact on the dental applicant pool.

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Key words: feeder institutions, dental school recruitment, minority recruitment, advising

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One of the major challenges faced by dental education today is the recruitment of qualified applicants who are capable of serving the oral health care needs of a culturally and economically diverse U.S. population. To achieve this goal, dental schools must continue to attract applicants with both a history of strong academic performance and the ability to succeed as future dental health care workers.

At present, dental schools rely almost exclusively on traditional four-year colleges and universities as their primary source of applicants. Most dental schools require applicants to complete a minimum of three years of college or higher education prior to matriculation.[1] Colleges and universities considered successful at providing applicants to dental programs can be identified as "feeder" institutions. Data from the Associated American Dental School Application Service (AADSAS) has been used to gain insight into trends and characteristics of dental school applicants and enrollees[2,3]; however, there is limited information on the undergraduate institutions that applicants attend.

The purpose of this study was to identify and characterize the feeder institutions that are the major source of applicants to U.S. dental schools. Specifically, feeder colleges and universities were compared using total enrollment, degree status, geographic distribution, religious affiliation, numbers of minority applicants, and college admissions selectivity criteria.

Methods

Dental school applicant data, including degree status, institution, and demographic information, were obtained from AADSAS for the 2002-03 ad-

missions cycle. According to degree status responses, AADSAS reported 4,698 applicants with an undergraduate degree and 4,129 working on a degree in-progress; their combined total was used for the number of applicants in this study. This total includes 1,880 applicants who responded to both degree questions.

Of the 1,149 colleges and universities that supplied at least one applicant to dental school, 23 percent contributed five or more and were defined as feeder institutions. Feeder schools were ranked by their total numbers of applicants (Category 1) and, to minimize the effect of school size, by their ratios of applicants to total undergraduate enrollment (Category 2). Lists of the top fifty feeder schools by category were compiled and compared using school size, geographic distribution, religious affiliation, and college admissions selectivity criteria as reported by *Barron's Profile of American Colleges* (2000 edition).[4] Barron's admissions selectivity rankings (most competitive [MC] > highly competitive [HC] > very competitive [VC] > competitive [C] > less competitive [LC] > non-competitive [NC]) were based on SAT/ACT scores, high school class rank, GPA, and acceptance rates of applicants. Because of the size of the minority applicant pool, black and Hispanic feeder institutions were defined as schools with two or more minority applicants. A total of seventy-five black and fifty-eight Hispanic feeder institutions were identified and compared by total enrollment and geographic distribution.

Results

Results in Table 1 show that feeder schools (those with five or more applicants) constituted 23 percent of all colleges and universities that supplied at least one applicant to dental school. However, these feeder institutions were responsible for 75 percent of the total applicant pool, with 7 percent of them supplying 49 percent of total applicants.

A list of the top fifty Category 1 and Category 2 institutions appears in Table 2. The top fifty Category 1 feeder institutions are arranged in descending order of total numbers of applicants to dental schools. The top fifty Category 2 feeder institutions are arranged according to their ratios of dental applicants to total school enrollments. Definitive rankings may be relative because 1,880 applicants identified that they had both an undergraduate degree and a degree in-progress. The top fifty Category 1 schools contributed 48 percent of the total number of dental school applicants, while the top fifty Category 2 schools contributed 35 percent. These percentages are reflective of the fact that twenty-two schools qualified as both top fifty Category 1 and top fifty Category 2 feeder institutions and supplied 28 percent of the total applicants.

The average total enrollment of the top 50 Category 1 schools was over 19,000 students with an average of 67 applicants per institution. Therefore, there was approximately one applicant to dental school for every 284 students enrolled in the Category 1 schools (Table 3). The average total enrollment of the top fifty Category 2 schools was approximately 8,500 students with an average of forty-nine applicants, or about one dental applicant for every 173 students enrolled (Table 3).

Table 4 reports that 68 percent (seventeen institutions) of the top twenty-five Category 2 schools were affiliated with or had student bodies associated with a particular religion. The largest percentage of these institutions (24 percent) were affiliated with the Seventh-Day Adventist Church. However, the greatest percentage of applicants from these Category 2 feeder schools (27 percent) came from colleges and universities associated with the Mormon religion.

Approximately 65 percent of the applicants from the top fifty Category 1 and Category 2 feeder

Table 1. Profile of 2002-03 dental school applicant pool

Number of Applicants/Institution	Number of Institutions	Total Number of Applicants	Percent of Total Institutions	Percent of Total Applicants
≥25	84	4,335	7%	49%
15-24	56	1,052	5%	12%
5-14	128	1,053	11%	12%
≥5	268	6,640	23%	75%
<5	881	2,187	77%	25%

Table 2. Rankings of the top fifty Category 1 and Category 2 feeder institutions

Top Fifty Category 1 Feeder Institutions	Top Fifty Category 2 Feeder Institutions
Brigham Young Univ.* †	La Sierra Univ. †
Univ. of California, Los Angeles*	Univ. of the Pacific
Univ. of Florida*	Pacific Union College †
Univ. of Washington*	Rutgers State Univ. of New Jersey
Univ. of California, Davis*	Xavier Univ. †
Univ. of California, Irvine*	Meharry Medical College †‡
Univ. of Utah* †	Loma Linda Univ. †
Univ. of North Carolina at Chapel Hill*	Walla Walla College †
Univ. of California, San Diego*	Yeshiva Univ. †
Ohio State Univ.	Univ. of California, Los Angeles
Univ. of Michigan*	Andrews Univ. †
Arizona State Univ.	Brigham Young Univ. †
Univ. of Southern California*	Univ. of California, Irvine
Univ. of California, Berkeley	Birmingham Southern College †
Univ. of the Pacific*	Creighton Univ. †
Virginia Commonwealth Univ.*	Nova Southeastern Univ.
Michigan State Univ.	Saint John's College. †
Univ. of Toronto	Saint Olaf College †
Univ. of Iowa	Univ. of Nebraska Wesleyan †
Indiana Univ.*	Univ. of North Carolina at Chapel Hill
Florida International Univ.	Univ. of California, Davis
Univ. of Illinois at Chicago	Univ. of California, San Diego
Utah State Univ. †	Oakwood College †
Univ. of Illinois at Urbana	Southern Utah State Univ. †
Univ. of Kentucky	Univ. of Utah †
Univ. of British Columbia	Univ. of California, Riverside
La Sierra Univ.* †	Univ. of Southern California
Univ. of Nevada, Las Vegas	Willamette Univ.
Univ. of Minnesota, Twin Cities	Univ. of Washington
Rutgers State Univ. of New Jersey*	Southern Adventist Univ. †
Univ. of California, Riverside*	Virginia Commonwealth Univ.
Portland State Univ.*	Indiana Univ.
Univ. of Maryland	Albion College †
Univ. of Texas at Austin	Howard Univ.
State Univ. of New York at Binghamton*	Emory Univ. †
Oregon State Univ.*	State Univ. of New York at Binghamton
Weber State Univ.	Univ. of Missouri-Kansas City
New York Univ.	Gonzaga Univ. †
Univ. of California, Santa Barbara	Univ. of Rochester
Univ. of Western Ontario	Case Western Reserve Univ.
Univ. of Wisconsin, Madison	Rutgers State Univ. of New Jersey
State Univ. of New York at Buffalo	Portland State Univ.
Wayne State Univ.	Univ. of Florida
Univ. of South Florida	Concordia Univ. †
Idaho State Univ.*	Washington Univ.
Clemson Univ.	Idaho State Univ.
Univ. of Nebraska, Lincoln	Oregon State Univ.
Xavier Univ. of Louisiana* †	Univ. of Michigan, Ann Arbor
Univ. of Pittsburgh	Barnard College
North Carolina State Univ.	Marquette Univ. †

*Denotes institutions appearing on both Category 1 and Category 2 top fifty lists.
† Denotes institutions affiliated with and/or student bodies of secular schools associated with a particular religion.
‡ Applicants from this institution participated in postgraduate programs.

institutions came from schools with admissions selectivity criteria classified by Barron's in 2000 as highly competitive, while less than 1 percent came from schools designated most competitive (Tables 5 and 6).[4]

Colleges and universities with five or more applicants to dental school were concentrated in geographically distinct regions of the country (Figure 1). For example, 34 percent of the total applicants from feeder institutions attended schools in the Southwest. Of these, 85 percent attended colleges and universities in California or Utah. Combined with Florida and New York, these four states accounted for 41 percent of all applicants from feeder institutions.

Table 3. Comparison of enrollment and dental school applicants of Category 1 and 2 top fifty feeder institutions

Feeder Institutions	Average Enrollment	Average Number of Applicants	Ratio of Average Number of Applicants/Average Enrollment
Category 1	19,058	67	1:284
Category 2	8,490	49	1:173

In contrast, Figure 2 illustrates that minority feeder schools, those with two or more black or Hispanic applicants, were concentrated in the Southeast (including Puerto Rico). For example, 53 percent of the total minority applicants from minority feeder schools attended colleges and universities in this region, with the majority of these coming from Florida, Tennessee, Louisiana, and Puerto Rico.

Hispanic feeder institutions had larger average enrollments than black feeder schools. Approximately 35 percent of black feeder institutions and 19 percent of Hispanic feeder institutions had enrollments of fewer than 5,000 students (Table 7). In general, regardless of school size, the average number of minority applicants from black or Hispanic feeder institutions was comparable.

Discussion

The year 1998 marked a significant shift in the pattern of applicants to U.S. dental schools. Throughout the 1990s the number of yearly applicants had steadily increased; however, after 1997 this trend reversed.[3] Weaver et al. reported a 24.6 percent decrease in the number of applicants to dental schools between 1997 and 2001.[2] Various reasons have been proposed to explain the decline in applicants, including competition among occupations for talented youth, the rising cost of dental education, and financial changes in the health care system.[3]

While the number of applicants to dental schools has decreased over the past several years, the number of first-year enrollees continued to increase approximately 15 percent since 1989.[2] During the same period, the number of underrepresented minority applicants and enrollees also increased slightly, but still does not reflect the overall population demographics in the United States. In 2000, for example, Hispanics and blacks comprised nearly 25 percent of the total U.S. population, yet only about 10 percent of dental school enrollees.[5]

The dental profession, and dental schools in particular, are faced with the challenge of recruiting a qualified, diverse applicant pool that is capable of serving the current and future oral health care needs of an ever-increasing U.S. population. Historically, the dental profession has relied on initiatives such as the Select Program[6] as well as career resources offered by the American Dental Association to increase awareness of careers in dentistry. Other initiatives have focused primarily on the recruitment and retention of minority applicants through outreach and enrichment programs.[7] However, one area that has received little attention is the identification and characterization of the colleges and universities that provide the majority of applicants to dental schools. Traditionally, many colleges and universities provide only advising services for careers in the health professions. It is likely that these institutions also have the potential to serve as primary resources for promoting interest and awareness in dentistry as a viable career choice. The purpose of our study was to identify and characterize the feeder institutions that

Table 4. Religious affiliations of the top twenty-five Category 2 feeder institutions

Religious Affiliation	Number of Institutions	Percent of Total Category 2 Top 25 Feeder Institutions	Number of Applicants	Percent of Total Applicants from Category 2 Top 25 Feeder Institutions
Seventh-Day Adventist	6	24%	143	10%
Catholic	3	12%	76	5%
Methodist	3	12%	32	2%
Mormon	3	12%	401	27%
Lutheran	1	4%	21	1%
Jewish	1	4%	23	2%
All nonsecular	17	68%	696	47%

are the major source of applicants to U.S. dental schools in anticipation that this information will be useful in developing recruitment strategies.

Results from this study indicate that the majority of applicants to U.S. dental schools are supplied by relatively few institutions. It appears that some colleges and universities are better able to foster an environment that promotes an interest in the profession. In terms of total applicants, the best feeder institutions were typically those with large undergraduate enrollments. For example, institutions each providing at least 100 applicants in 2003 had an average enrollment of more than 23,000 students. These findings are not surprising in that one would expect larger institutions, by virtue of their size, to have more students interested in pursuing a dental career. However, a number of smaller schools had better average applicant per total enrollment ratios than larger institutions, suggesting that factors other than size may be playing a significant role in the success of feeder institutions.

It is apparent that a number of the larger institutions also had high applicant to total enrollment ratios, thus indicating an atmosphere conducive to encouraging and developing potential dental applicants. It is possible that students may have chosen to attend these institutions because of their reputations for the high acceptance rates of their graduates into dental programs. Furthermore, it is possible that these colleges and universities offer a wide range of predental activities designed to produce highly qualified applicants.

On a percentage basis, the majority of dental school applicants attended feeder institutions located in four states: California, Utah, Florida, and New York. Three of these, California, Florida, and New York, are among the most populous states in the nation. However, even though Utah is ranked thirty-fifth in population, its feeder institutions had the second highest number of applicants (526) to dental schools in 2003, with the majority attending Brigham Young University.

Nearly 70 percent of the top twenty-five Category 2 schools had some type of religious affiliation. Of these, the Seventh-Day Adventist Church accounted for six feeder institutions: La Sierra University, Pacific Union College, Loma Linda University, Walla Walla College, Andrews University, and Oakwood College. Collectively, these institutions contributed a total of 143 applicants to dental school. A reason for this may be that this church, according to its beliefs and official statements, emphasizes, respects, and encourages careers in the health professions, including dentistry. The Church of Jesus Christ

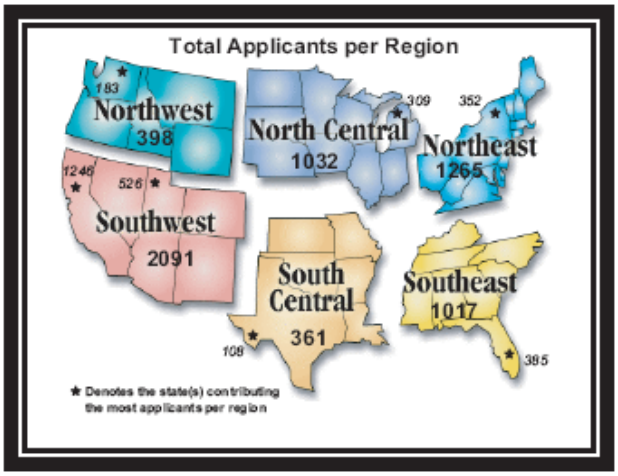

Figure 1. Geographic distribution of applicants from all feeder institutions

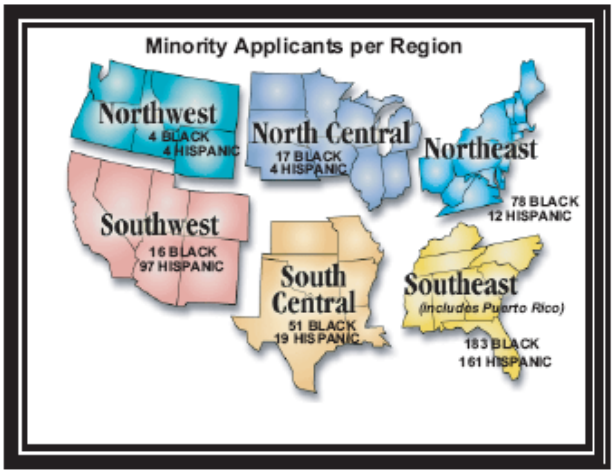

Figure 2. Geographic distribution of minority applicants from minority feeder institutions

Table 5. Competitive status* of the top fifty Category 1 feeder institutions

Competitive Status	Number of Institutions	Number of Applicants	Percent of Total Applicants from Top Fifty Category 1 Feeder Institutions
MC	0	0	0%
HC	13	1,283	38%
VC	15	907	27%
C	12	654	19%
LC	4	220	7%
NC	3	142	4%
N/A	3	152	5%

*Selectivity profile as reported by *Barron's Profiles of American Colleges* (2000 ed.): Most Competitive (MC), Highly Competitive (HC), Very Competitive (VC), Competitive (C), Less Competitive (LC), and Non-Competitive (NC).

Table 6. Competitive status* of the top fifty Category 2 feeder institutions

Competitive Status	Number of Institutions	Number of Applicants	Percent of Total Applicants from Top Fifty Category 1 Feeder Institutions
MC	2	29	1%
HC	12	1,117	45%
VC	15	524	21%
C	11	541	22%
LC	6	185	8%
NC	2	23	1%
N/A	2	42	2%

*Selectivity profile as reported by *Barron's Profiles of American Colleges* (2000 ed.): Most Competitive (MC), Highly Competitive (HC), Very Competitive (VC), Competitive (C), Less Competitive (LC), and Non-Competitive (NC).

of Latter-Day Saints (Mormon) had only three institutions within the top twenty-five Category 2: Brigham Young University, Southern Utah State, and the University of Utah. However, these three institutions contributed more than 400 total applicants. Like the Seventh-Day Adventist Church, the Mormon Church also cites a dedication to the community and a life of service as one of its fundamental tenets.

The admissions selectivity profiles of the top fifty feeder institutions in both categories were examined because they provide a general measure of overall student academic ability. None of the top fifty Category 1 feeder institutions were classified as most competitive, a ranking that includes Ivy League institutions and other premiere programs. The majority of applicants, 65 percent, attended highly or very competitive feeder institutions. It appears that students who attend the most selective colleges and universities are not pursuing careers in dentistry. It is possible that these schools attract students whose primary interest in terms of health care may be the field of medicine. Similar results were observed for the top fifty Category 2 feeder institutions, with only two schools being classified as most competitive. It seems that the most competitive institutions may be an untapped resource in terms of recruiting qualified dental school applicants.

One of the major challenges faced by U.S. dental schools is the recruitment of qualified underrepresented minority applicants. Traditionally, black and Hispanic dental students each comprise approximately 5 percent of total dental school enrollees.[5] Of the 1,149 total schools identified in this study, 133 qualified as minority feeder institutions for dental schools (two or more black or Hispanic applicants), with only fifteen of these supplying ten or more minority applicants. The majority of black and Hispanic applicants (53 percent) from minority feeder institutions attended schools concentrated in

Table 7. Enrollment and minority applicant data from black and Hispanic feeder institutions

Feeder Institutions	Average Enrollment	Average Number of Minority Applicants	Ratio of Average Number of Minority Applicants/Average Enrollment	Institutions with <5,000 Students
Black (75)	10,752	4.7	1:2,288	26
Hispanic (58)	14,800	5.1	1:2,902	11

the southeastern region of the United States, including Puerto Rico. In contrast, minority feeder institutions located in the northwestern region provided a total of only four black and four Hispanic applicants. This fact may be attributed to the low minority population density in this area of the country.

Conclusions

The results of this study indicate that the majority of 2002-03 dental school applicants were from feeder institutions with large student enrollments. However, many smaller feeder schools based on Category 2 criteria had better dental school applicant to total enrollment ratios than large universities. While one out of every 173 students in Category 2 schools applied to dental school, only one out of every 284 students in Category 1 schools applied.

Within the top fifty Category 1 and 2 feeder institutions, fewer than 1 percent of applicants attended the nation's most competitive colleges and universities, thus suggesting that students from the most selective schools are not pursuing careers in dental medicine.

Seventeen of the top twenty-five Category 2 schools (68 percent) were institutions affiliated with or had student bodies associated with a particular religion, including the Seventh-Day Adventist Church, Roman Catholic, Methodist, Mormon, Lutheran, and Jewish. Two of these religious groups, the Seventh-Day Adventist Church and Mormon Church, accounted for 37 percent of all applicants from the top twenty-five Category 2 schools.

California and Utah had the greatest number of applicants, accounting for 28 percent of the total applicants from feeder institutions, followed by Florida (6.2 percent) and New York (5.7 percent). While the majority of applicants from all feeder institutions attended schools in the southwest region, minority applicants from all minority feeder institutions were concentrated in the southeastern portion of the country.

It is anticipated that a better understanding of top feeder institutions will aid dental school recruitment efforts and assist colleges and universities not traditionally associated with a strong predental focus to develop and promote careers in dental medicine. Results from this study suggest that some institutions are more successful at providing an environment that encourages an interest in dentistry. Factors such as school size, geographic location, religious affiliation, and admissions selectivity criteria of colleges and universities may each have a direct impact on the potential dental applicant pool.

We are exploring other factors that may also contribute to the success of feeder institutions. Preliminary studies suggest that organized predental enrichment activities, such as student-run organizations, preprofessional health advising, volunteer/community outreach programs, financial incentives, and instructional opportunities, are common to many of the nation's top feeder programs.

Acknowledgments

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Predental Enrichment Activities of U.S. Colleges and Universities

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Abstract: The purpose of this study was to examine predental enrichment activities and their impact on the number of applicants from some of the nation's top dental school feeder institutions (DSFI). The DSFI were identified by their total number of applicants to dental schools and the number of applicants per total student enrollment. A survey consisting of twenty-seven questions on possible predental enrichment activities was administered by phone or sent by email to eighty-eight DSFI, with forty-nine responding. In addition to identifying and characterizing the most common predental enrichment activities, the relationships among the number of applicants, predental activities, and total student enrollments per institution were evaluated. The total number of dental school applicants/institution was correlated with the total student enrollment/institution (r=0.529) and the number of predental activities/institution (r=0.520). No correlation was observed between the number of activities at an institution and dental school applicants per thousand enrolled. Sixteen of the DSFI reported ten or more enrichment activities, the most common being preprofessional health advising (96 percent), dentistry club (88 percent), and volunteer programs (73 percent). In general, larger institutions produced more applicants and provided more enrichment activities. However, there was no correlation between the number of dental school applicants per thousand students enrolled and the number of activities at an institution. Results indicate that there are specific predental enrichment activities common to some of the top dental school feeder institutions in the United States. A better understanding of successful feeder programs may assist nonfeeder schools in developing or strengthening an interest in dentistry as a career option.

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Key words: feeder institutions, preprofessional health advising, dental school recruitment

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Results from a previous study indicated that the majority of applicants to U.S. dental schools were supplied by relatively few feeder institutions.[1] Feeder schools, as identified by 2002-03 Associated American Dental Schools Application Service (AADSAS) data, were defined as any institutions with five or more applicants to dental school. These colleges and universities were ranked by their total number of applicants and by their ratio of applicants to total undergraduate enrollment. The study considered factors such as school size, geographic location, religious affiliation, and admissions selectivity criteria of feeder institutions and their relative influence on the potential dental applicant pool. Also, it was noted that additional dynamics probably contributed to the success of feeder institutions at fostering an environment to promote an interest in the dental profession.

The purpose of our study was to identify the predental enrichment activities common to some of the nation's top dental school feeder institutions (DSFI) and assess their impact on the number of dental school applicants. Major areas examined included student organizations, preprofessional health advising, volunteer or community outreach programs, financial incentives, and instructional opportunities. The hypothesis underlying this study was that a better understanding of enrichment activities at DSFI may assist other undergraduate institutions in developing strategies that promote an interest in dental careers and increase the number of qualified dental school applicants.

Methods

A survey was developed to assess predental enrichment activities at some of the top DSFI. The survey consisted of twenty-five yes/no and two open-ended questions that examined twenty different activities and support services. The questions were compiled through web-based research and discussions with preprofessional health advisors. The survey (Figure 1) was administered by phone or sent by email to college or university representatives from the top eighty-eight DSFI, which included schools ranked by their total number of dental school appli-

cants or their applicant to total enrollment ratios.[1] A total of forty-nine schools (56 percent) responded (Table 1). Dental school applicant data of the DSFI was obtained from AADSAS for the 2002-03 admissions cycle; college and university enrollment data was obtained from *Barron's Profile of American Colleges* (2000 edition).[2]

The data was analyzed using basic descriptive statistics; Pearson correlation coefficients were used in determining relationships among variables. Predental enrichment activities were ranked according to their frequencies as reported in the survey. The following relationships were compared: 1) a DSFI's total number of dental school applicants and the num-

Directions: Please select "yes" or "no" in response to the following questions, including additional information when applicable.

Institutional Information
Name of Institution:
Name of Individual Completing the Survey:

The University in General
1. Does your institution offer predentistry as a major?
2. Does your institution have a dental school? If no, is your institution closely associated with a particular dental school at another institution?
3. Does your institution offer the option of a combined B.S./D.M.D. or B.S./D.D.S. degree program? If yes, how many years does the program take to complete (8, 7, or 6 years)?
4. Does your institution offer scholarships specifically reserved for predental students? If yes, do the scholarships cover: full tuition, half tuition, other (specify)?
5. Does your institution offer a DAT review or preparation course?
6. Does your institution offer undergraduate courses providing an overview or introduction to dentistry? If yes, are such courses for credit? What is the basic format of the course(s): lecture, lab, or combination?

Advising
7. Does your institution offer a specific preprofessional health advising program?
8. Is there a specific predental advisor?
9. Is there a prehealth committee that provides predental students with letters of recommendation?
10. Does the advising department offer workshops on writing personal statements for dental school applications?
11. Does the advising department conduct practice interview sessions with predental students?

Student Involvement
12. Does your institution have a Predental Honors Society?
13. Does your institution have a chapter of ASDA (American Student Dental Association)?
14. Does your institution have a dentistry club or group of any sort? If yes, how many students are involved?
15. Are the predental group's activities distinct from those of a premedical group?
16. Does the group advertise? If yes, through which of the following: posters, campus newspaper, campus TV channel, email, other (specify)?
17. Does the group do fundraising?
18. Does the group have a website? If yes, what is the address?
19. Is there any sort of yearly, monthly, etc. publication detailing activities of the dental group?
20. Does your institution have any clubs or organizations specific to minority or special interest group involvement in the field of dentistry? If yes, for which of the following groups: women, Hispanic, black, other (specify)?

Volunteer/Community Outreach
21. Are there volunteer programs offered through your institution that provide students access and experience in the field of dentistry? If yes, including which of the following: clinic, homeless shelter, hospital, local private dental practice(s), elementary/middle schools, other (specify)?
22. Does your institution offer any type of clinical observation program?
23. Does your institution have dental care facilities on campus?
24. Does your institution offer a shadowing program within the field of dentistry?
25. Does your institution participate in or organize oral health outreach experiences to elementary or middle school-aged children?

Other
26. On average, how many applicants to dental school does your institution have each year?
27. Please briefly describe any additional programs, activities, organizations, etc. your institution may have.

Figure 1. University of Connecticut School of Dental Medicine: college/university predental program survey

Table 1. DSFI responding to survey

Arizona State University	University of Arizona
Birmingham-Southern College	University of California, San Diego
Brigham Young University	University of California, Berkeley
Clemson University	University of California, Riverside
College of Charleston	University of Florida
Creighton University	University of Illinois at Chicago
Florida Atlantic University	University of Iowa
Florida International University	University of Kansas
Howard University	University of Kentucky
Idaho State University	University of Miami
Kansas State University	University of Michigan at Ann Arbor
Miami University	University of North Carolina at Chapel Hill
North Carolina State University	University of Oregon
Ohio State University	University of South Carolina
Pacific Union College	University of Southern California
Pennsylvania State University	University of Texas at Austin
Portland State University	University of Utah
Saint John's University	University of Virginia
Saint Olaf College	University of Wisconsin at Madison
Southern Adventist University	Utah State University
Southern Utah University	Virginia Commonwealth University
State University of New York at Binghamton	Virginia Polytechnic Institute and State University
State University of New York at Buffalo	Walla Walla College
The George Washington University	Willamette University
	Xavier University of Louisiana

ber of predental enrichment activities, 2) a DSFI's dental school applicants and total enrollment, and 3) a DSFI's dental school applicants per thousand students and total activities.

Results

Results in Table 2 show that reporting DSFI had an average of forty-nine applicants to dental school (range 8 to 258) and an average student enrollment of 15,355 (range 1,143 to 36,861). The schools reported an average of eight predental enrichment activities per institution (range 2 to 15). Of these institutions, 33 percent reported ten or more activities.

Table 2. General description of dental school feeder institutions (DSFI)

DSFI (n=49)	Minimum	Maximum	Average
# of Applicants to Dental School	8	258	49
Total Student Enrollment	1,143	36,861	15,355
# of Activities	2	15	8

As shown in Table 3, the enrichment activities most frequently identified by the DSFI were preprofessional health advising programs (96 percent of institutions), dental clubs (88 percent), and volunteer programs (73 percent). The frequencies of other predental enrichment initiatives were reported as follows: specific predental advising (69 percent), practice interview sessions (61 percent), shadowing programs (59 percent), personal statement workshops (53 percent), committees for letters of recommendation (49 percent), clinical observation programs (45 percent), oral health outreach to elementary/middle schools (39 percent), on-campus dental care facilities (37 percent), dentistry overview/introduction courses (31 percent), DAT review courses (27 percent), predental honors societies (20 percent), affiliated dental schools (20 percent), ASDA chapters (18 percent), special interest/minority dental groups (16 percent), scholarships for predental students (10 percent), combined degree programs (10 percent), and predentistry as a major (6 percent).

Of the forty-three DSFI identifying a dental club (Figure 2), 26 percent reported a combined premedical/predental organization, while 74 percent indicated that the group was specific to the field of dentistry. Dental club activities included advertising in the form of posters, email, and campus newspapers (76 percent), as well as fundraising (42 percent), website development (36 percent), and yearly or monthly publications (16 percent). A total of thirty-six of the forty-nine DSFI reported volunteer and community outreach programs. These volunteer programs were located in a variety of settings, including clinics (67 percent), elementary/middle schools (67 percent), hospitals (28 percent), local private dental practices (28 percent), and homeless shelters (25 percent) (Figure 3).

Pearson correlation coefficients were used to measure the linear relationships among the total number of predental enrich-

ment activities, total number of applicants to dental school, and total student enrollments. The total number of dental school applicants was significantly correlated with the number of predental activities per institution, with a positive r value of 0.529 (Figure 4). A strong correlation was also observed between the total number of dental school applicants and an institution's total student enrollment (r=0.520) (Figure 5). However, there was no correlation between the number of activities at an institution and the number of dental school applicants per thousand enrolled (r=–0.047) (Figure 6).

Table 3. Most common predental enrichment activities

Characteristic/Predental Activity	# of Institutions (n=49)	% of Institutions
Preprofessional health advising program	47	96
Dentistry club	43	88
Dentistry volunteer opportunities	36	73
Predental advisor	34	69
Practice interview sessions	30	61
Shadowing program	29	59
Personal statement workshops	26	53
Letters of recommendation committee	24	49
Clinical observation program	22	45
Elementary/middle school oral health outreach	19	39
On-campus dental care facilities	18	37
Dentistry overview/intro. course(s)	15	31
DAT review course	13	27
Dental school	10	20
Predental honors society	10	20
ASDA chapter	9	18
Special interest/minority dentistry group	8	16
Combined degree program	5	10
Predental specific scholarships	5	10
Predentistry as a major	3	6

Discussion

It has been suggested that preprofessional health advising plays a key role in encouraging students to explore the idea of a dental career.[3] Results from the current study support this observation, as nearly all of the responding DSFI had a preprofessional health advising program. Furthermore, many schools specified that the preprofessional health advising program at their institution included a dedicated predental advisor. According to a 2003 American Dental Education Association (ADEA) survey, only 31 percent of students graduating from dental schools had decided on a career in dentistry upon beginning their freshman year of college.[4] This finding suggests that career and preprofessional health advisors can play an important role in directing undergraduate students toward a future career in dentistry.

It has been proposed that dental clubs may help to foster an interest in dentistry as a profession.[3] Our results indicate that predental clubs are a common feature shared by many of the top DSFI. Dental clubs can provide students the opportunity to participate in educational, community, and social activities that will enhance their knowledge of the profession and assist them in becoming excellent dental school applicants. Predental groups offer a mechanism for organizing and participating in shadowing experiences, dental workshops, and volunteer outreach programs. For example, students may participate in offering oral hygiene instruction to young children at local day care centers, sponsoring blood drives and food share programs, and providing tutorial services. Societies may also offer courses and access to guest speakers, including admissions officers, specialists, and dental students. Through these opportunities, predental clubs allow students to actively demonstrate their commitment to dentistry as a career. As a recruitment initiative, dental schools

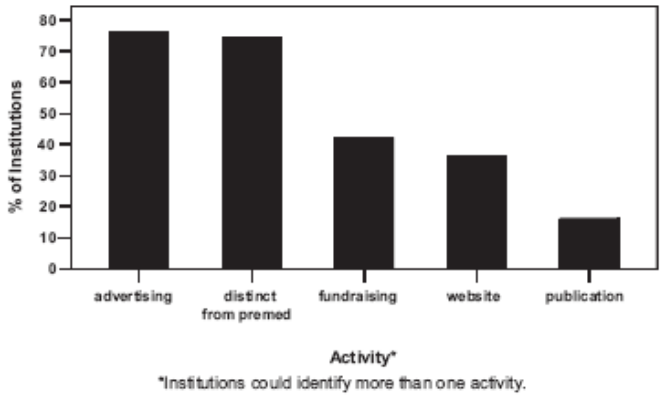

Figure 2. Characteristics of predental clubs

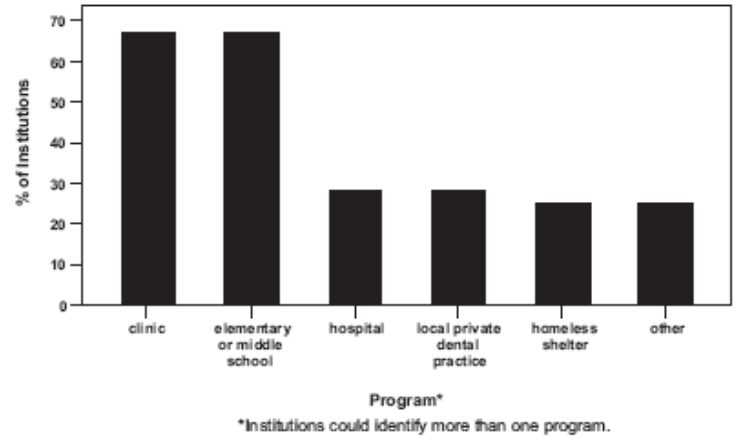

Figure 3. Volunteer and community outreach programs

may wish to assist regional colleges and universities in establishing predental clubs on campus.

The dental profession is constantly challenged with maintaining an applicant pool that is academically qualified, culturally sensitive, and ethnically diverse. Typically, the dental profession has relied on strategies sponsored by the American Dental Association to increase awareness of careers in dentistry. Other initiatives have focused on the recruitment and retention of minority applicants through outreach programs.[5] Unfortunately, most of these strategies are not self-sustaining, as they rely heavily on continuous funding and do not promote a permanent structural change within the system.

The current study suggests that assisting traditional four-year colleges and universities to develop enrichment and educational strategies can perhaps have a meaningful impact on the size and quality of the dental applicant pool. For example, dental schools or even private practitioners could identify key personnel at local and regional institutions and give them the opportunity to participate in workshops that focus on dental careers, dental school requirements, admissions, and education. Dental schools could also assist in the establishment of on-campus predental clubs to offer students academic, community, and social opportunities. Support for the clubs might include the identification of a faculty advisor and the recruitment of community dentists to provide mentoring experiences, as well as guidance in drafting a constitution, advertising and fundraising strategies, and website development. Such an approach would eventually establish viable recruitment programs that are self-sustaining and require minimal financial commitments.

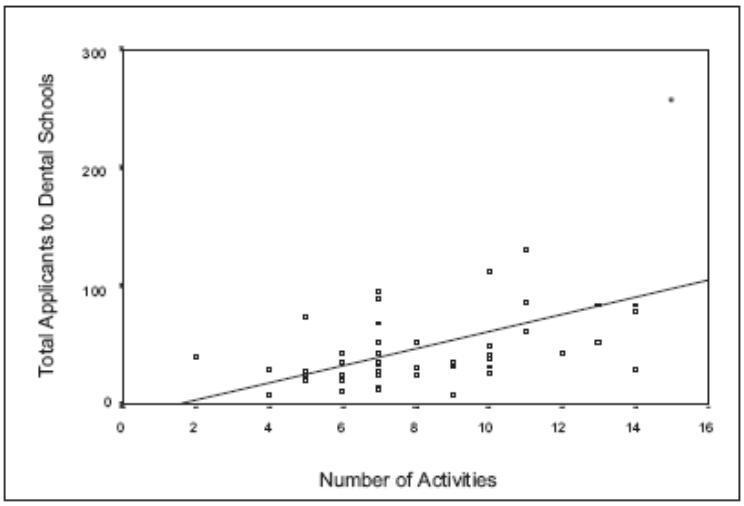

Figure 4. Relationship between total applicants and number of activities per institution

r=0.520

Results from this study indicate that the total number of dental school applicants at a college or university is positively correlated with the total number of predental activities at the institution. The availability of preprofessional health advising and predental societies appears to be essential to the success of most DSFI. However, the addition of other enrichment and educational activities may serve to further enhance the dental applicant pool. For example, local dentists may be contacted to serve as advisors, as a source of shadowing experiences, and as presenters for educational or workshop programs.

Conclusion

The current study indicates that there are specific predental enrichment activities common to some of the top dental school feeder institutions in the United States, including pre-professional health advising, an on-campus dental society, and volunteer opportunities. These three activities most common to feeder institutions could serve as the foundation for establishing strong predental curricula at other U.S. colleges and universities. A better understanding of potential enrichment and educational initiatives may assist nonfeeder schools in developing an interest in dentistry as a career option within their student bodies and also serve to increase the overall size and quality of the dental applicant pool.

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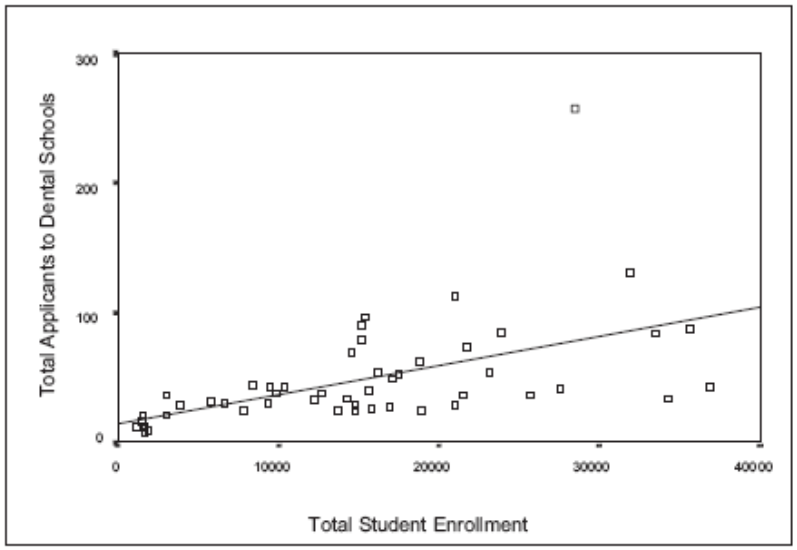

Figure 5. Relationship between total applicants and total student enrollment per institution

r=0.529

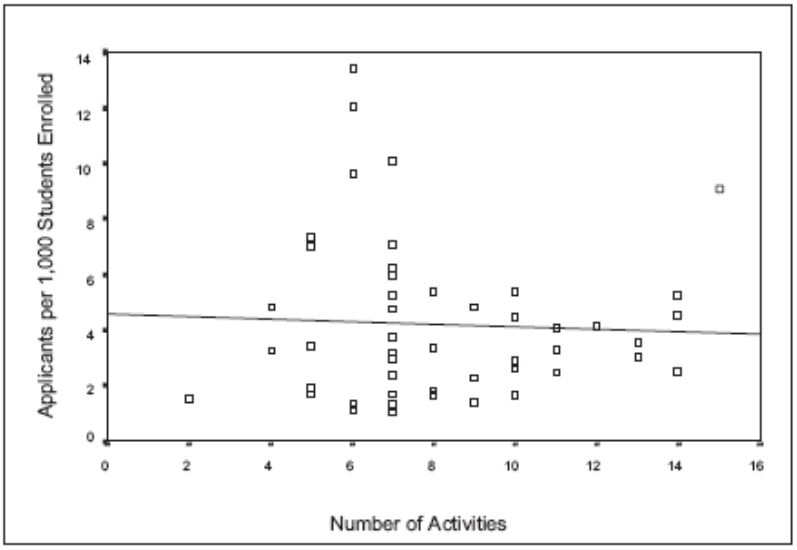

Figure 6. Relationship between applicants per 1,000 students and number of activities/institution

r=-0.047

Nonacademic Characteristics of Dental School Applicants

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Abstract: The purpose of this study was to characterize the average dental school applicant's participation in four nonacademic areas: shadowing, extracurricular activities, volunteer experiences, and research. Demographic, academic, and nonacademic information was compared for 12 percent of all applicants to U.S. dental schools in 2005. Applicants had an average GPA of 3.23 and DAT Academic Average of 18.6. Applicants participated in an average of 3.7 extracurricular activities, 3.2 volunteer experiences, and 0.8 research projects. The average nondental employee applicant shadowed 172 hours. As shadowing hours increased, GPA declined. While academically similar, women reported significantly greater ($p<.05$) participation in all four nonacademic areas than males. Overall, Hispanic students reported the most shadowing hours and had the greatest percentage of parents as dentists, while black students had the least in both areas. Black students reported the most extracurricular activities. More than 90 percent of all applicants participated in three or four of the major nonacademic areas. Participation in extracurricular activities, volunteer experiences, and research projects was correlated; however, there was no relationship between shadowing hours and the other areas. Applicants with the most shadowing tended to be less academically qualified. The typical applicant reported a total of approximately eight extracurricular, volunteer, and research endeavors and 170 or more hours of shadowing. Results of this study can assist dental admissions committees in making qualitative comparisons between applicants with similar academic qualifications and aid health career counselors in advising predental students.

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Key words: dental admissions, preprofessional health advising, noncognitive variables, dental school applicants

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Several studies[1-3] and a recent comprehensive literature review[4] have evaluated pre-admissions criteria of dental school applicants and their ability to predict future dental school performance. Academic credentials are the principal criteria used in the selection of dental students.[4] However, those credentials do not measure a candidate's commitment to society and health care, perseverance in personal interests, leadership potential, professionalism, or dedication to the advancement of knowledge. In order to assess these qualities, dental schools typically rely on personal statements, letters of recommendation, personality profiles, and interviews.[4] In addition, other nonacademic characteristics, including participation in shadowing, extracurricular activities, volunteer experiences, and research, may be used to identify desirable applicant qualities.

Early studies attempted to summarize and evaluate methods for measuring applicant participation in nonacademic activities. For example, one study provided an overview of the 1978 dental applicant pool based on AADSAS data.[5] Of the 9,690 total applicants, 84 percent were male and 16 percent female. About 53 percent reported participation in athletics, 44 percent in community service, 36 percent in health service, and 35 percent in a religious group. In a separate study, a nonstructured AADSAS biographical questionnaire was compared to nonacademic information obtained from an experimental, structured questionnaire.[6] The trial form involved questions that specifically addressed the applicant's efforts to explore dentistry as a career, nonacademic activities, demonstration of ability to relate to people, and special circumstances. The researchers concluded that both forms, though providing very different information, were equally reliable in ranking prospective dental students.

More recently, studies and reviews have attempted to identify nonacademic qualities that are essential to future dental health care professionals and evaluate their predictive value in assessing dental applicants.[4,7] In an analysis of applicants to Manchester Dental School for the 1996 entering class, interviews were constructed to evaluate criteria such as professional attitude, communication skills, team and leadership experience, nonacademic interests, manual dexterity, and work experience in dental-specific areas.[7] In this study, 65 percent of applicants were found to have some dental observation experience, 56 percent reported volunteer involve-

ment, and sports were the most commonly reported extracurricular activities.

The purpose of our study was to characterize the nonacademic activities reported by the typical applicant to the University of Connecticut School of Dental Medicine (UCSDM). Specifically, participation in shadowing experiences and extracurricular, volunteer, and research activities was quantified and described. In addition, comparisons were made between nonacademic areas as well as academic qualifications, gender, race, and ethnicity.

Methods

A database containing demographic, academic, and nonacademic information for 1,116 applicants to the UCSDM 2005 entering class was generated. Applicant demographic information, including gender, race, and ethnicity, and academic information, such as GPA and DAT scores, were obtained through the Associated American Dental Schools Application Service (AADSAS) Client Software Program. Information on applicants' participation in nonacademic pursuits, including extracurricular and volunteer programs, shadowing experiences, and research projects, was obtained directly from responses to AADSAS application questions. All applicant data were assessed without the use of identifiers, such as applicant name, address, social security number, or AADSAS identification number.

Basic descriptive statistics were used to assess the average numbers of all nonacademic characteristics and compare them to academic and demographic variables. Pearson correlation coefficients were used to compare applicant participation levels among the four nonacademic areas and GPA. T-tests were used to compare male and female applicant profiles. In addition, the types of extracurricular activities, volunteer experiences, and research projects were catalogued and characterized for the most active twenty-five participants in each area.

Table 1. UCSDM applicant pool demographics

	Total Applicants in Database=1,116
Male	617
Female	495
Black	37
Hispanic	62
Total GPA	3.23
Science GPA	3.12
DAT Academic Average	18.6
DAT Total Science	18.4
Dental Assistants (DA)/ Dental Hygienists (DH)	249

Results

Of the 1,116 total applicants reviewed in this study, 617 (55 percent) were male, and 495 (45 percent) were female (four were not specified). There were ninety-nine (9 percent) underrepresented minority applicants, consisting of thirty-seven blacks and sixty-two Hispanics. More than 22 percent of the applicant pool reported paid employment in a dental office as either a dental assistant or dental hygienist. The average overall GPA and science GPA for the total applicant pool were 3.23 and 3.12, respectively. Applicants had an average DAT Academic Average of 18.6 and a Total Science score of 18.4 (Table 1).

Approximately 42 percent of the applicants participated in shadowing, extracurricular, volunteer, and research activities, while nearly half (49 percent) reported participating in only three of these major nonacademic areas. The majority of applicants reported shadowing experiences (89 percent), with an overall average of 577 hours. On average, applicants reported visiting at least two different dental offices. General practice was the most common shadowing location (79 percent), followed by an orthodontic office (8 percent). Those employed as dental assistants or hygienists reported working in 2.6 dental offices for an average of 2,270 hours per applicant. Of those applicants not employed in a dental setting, 14 percent reported no shadowing, while the remaining 86 percent reported shadowing an average of 172 hours in 1.8 offices (Table 2).

A majority of applicants (93 percent and 94 percent, respectively) reported participating in extracurricular activities and volunteer experiences. On average, applicants participated in 3.7 extracurricular and 3.2 volunteer programs each. Research was reported by 52 percent of applicants, resulting in an overall average of 0.8 projects per applicant (Table 2).

When comparing applicant levels of participation within each of the nonacademic areas, we observed correlations between extracurricular activities, volunteer experiences, and research projects ($p \leq .01$). Increased participation in any one of these areas resulted in a similar increase in the other two. None of

Table 2. Profile of nonacademic applicant characteristics

Characteristic	Percentage Reporting	Average Per Applicant
Shadowing:	89%	577 hours (2.0 offices)
Non-DA/DH	86%	172 hours (1.8 offices)
Employed DA/DH	100%	2,270 hours (2.6 offices)
General Practice	79%	
Orthodontist	8%	
Other Specialty	13%	
Extracurricular Activities	93%	3.7
Volunteer Experiences	94%	3.2
Research Projects	52%	0.8

these three nonacademic areas was correlated with reported numbers of shadowing hours (Table 3).

Significant correlations were also observed when evaluating the relationship between GPA and certain nonacademic areas. Applicant participation in extracurricular activities was positively correlated with GPA ($p \leq .01$). However, a significant negative correlation was observed between shadowing hours and GPA ($p \leq .01$); therefore, as the number of reported shadowing hours increased, the average GPA declined (Table 3).

Figure 1 and Table 4 summarize the types of extracurricular activities, volunteer experiences, and research projects reported by the most active twenty-five participants in each area. This group of applicants participated in an average of 12.0 extracurricular activities, 11.4 volunteer experiences, and 4.8 research projects.

Extracurricular activities associated with arts and culture (30 percent) were most common, followed by the university community (21 percent), health and science (18 percent), sports and recreation (13 percent), academic (9 percent), and personal interest (9 percent). The most frequently reported volunteer experiences involved health service (35 percent), followed by education and mentoring (24 percent), special needs (18 percent), and local community (16 percent); 7 percent were unclear from the description. The majority (80 percent) of research projects investigated some aspect of general biology: health (40 percent), nonhealth (28 percent), or dental-specific (12 percent). A non-biological science was the focus of 9 percent of research projects, and 11 percent were non-science-related (Figure 1).

Females reported participating in significantly greater ($p < .05$) numbers of shadowing hours, extracurricular activities, volunteer experiences, and research projects than did their male counterparts. While males and females had similar overall GPAs, males had significantly higher DAT scores ($p < .001$) (Table 5).

Results in Table 6 compare the academic and nonacademic characteristics of applicants who were not dental assistants or dental hygienists based on racial and ethnic groupings. White applicants reported the most volunteer experiences, 3.2 per applicant, and were the most likely to have some type of shadowing experience (89 percent). These applicants also had

Table 3. Statistical correlations: participation in nonacademic activities

N=1,116	Shadowing Hours	Extracurricular Activities	Volunteer Experiences	Research Projects	GPA
Shadowing Hours		-.003	-.024	-.061	**-.130***
Extracurricular Activities	-.003		**.438***	**.174***	**.091***
Volunteer Experiences	-.024	**.438***		**.104***	.047
Research Projects	-.061	**.174***	**.104***		.005
GPA	**-.130***	**.091***	.047	.005	

Correlations are Pearson correlation coefficients (r value).
*Correlation statistically significant at p=0.01. Significant correlations also indicated in bold type.

Table 4. Examples of applicant involvement in nonacademic pursuits

Extracurricular Activities		
Arts and Culture	Multicultural organizations Dance and choir groups Religious organizations	Musical groups (band, orchestra) Drama clubs/theater Writing/poetry groups
University Community	Student government Newspaper staff Committees (activities, bylaws, etc.)	Campus orientation leader Resident assistant First-year ambassador/tour guide Greek life (fraternities, sororities)
Health and Science	ASDA Predental/medical clubs Science honors societies	Science fair participation American Chemical Society Engineering, biology, chemistry clubs
Sports and Recreation	Intramural athletics Collegiate teams Referee duties	Clubs (bowling, kayaking, hunting, fishing, skiing, mountain biking, etc.) Bodybuilding/fitness competitions
Academic	Teaching assistant Honors societies	Preprofessional societies Reading groups
Personal Interest	Automotive repair Beauty pageants Arts/crafts	Culinary clubs Computer clubs Environmental organizations
Volunteer Experiences		
Health Service	Hospital Red Cross Physician/dental office	Charity-sponsored walks/runs Fundraisers for special interests Oral hygiene/health outreach
Education and Mentoring	Tutoring Catechism Big Brothers/Big Sisters	Camp counselor Youth sports coach/instructor Boys and Girls Clubs
Special Needs	Elderly (nursing home) Special Olympics Homeless (Habitat for Humanity)	Hungry (soup kitchens, food drives) Animal shelters
Local Community	Political campaigns Crime prevention Neighborhood clean-up events	Beautification projects Library volunteer
Research Projects		
Biology: Health	Genetics Cancer research Cardiovascular studies	Surgery techniques Specialized topics (aging studies, cochlear implants, spina bifida, arthritis, West Nile)
Biology: Non-Health	Ecology Entomology Botany	Marine biology Animal biology Evolutionary biology
Biology: Dental	Cariology Periodontology Anatomy/morphology	Factors influencing oral health (smoking, vegetarianism, diabetes, etc.) Technological advances
Non-Biological Science	Organic chemistry Pharmaceutical research	Psychology Engineering
Non-Science	Computers/Internet Economics	Technology Language/phonetics

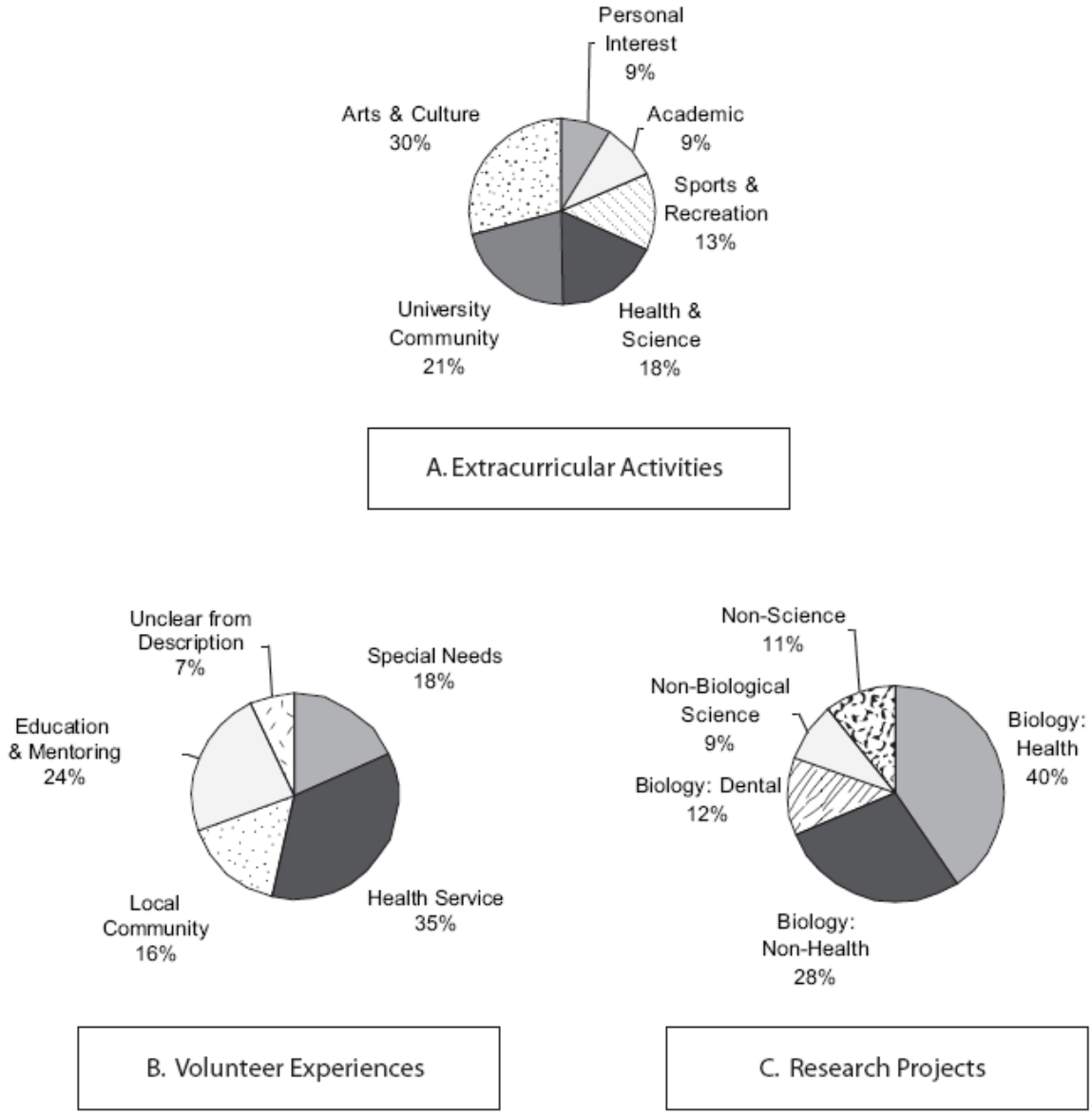

Figure 1. Distribution of participation in nonacademic pursuits

the highest overall GPA (3.34) as well as science GPA (3.25). Asian applicants reported the greatest number of research projects per applicant (0.9) and the highest DAT scores (TS 19.2, AA 19.4).

Black applicants reported the highest average number of extracurricular activities (4.8). However, these applicants reported significantly fewer shadowing hours than any other racial or ethnic group. Blacks were also the least likely to have a dentist as a parent (0 percent). Black applicants had the lowest DAT Total Science (17.9) and Academic Average (17.7) scores. Hispanic applicants reported significantly

Table 5. Male vs. female applicant profile

Nonacademic Activity	Male	Female
Shadowing Hours (Non-DA/DH)*	144	218
Dental Offices Visited	1.9	2.1
Extracurricular Activities**	3.4	4.0
Volunteer Experiences**	2.9	3.6
Research Projects***	0.8	0.9
Academic Parameter		
Total GPA	3.24	3.24
Science GPA	3.15	3.10
DAT Academic Average**	19.0	18.0
DAT Total Science**	18.9	17.8

Significantly different: *p<.01; **p≤.001; ***p<.05.

more shadowing hours than whites, Asians, and blacks with an average of approximately 250 hours per applicant. They were also most likely to have a dentist as a parent (24 percent) (Table 6).

Discussion

Numerous selection factors have been used in identifying qualified dental school applicants, including academic credentials, standardized test results, and assessments based on interviews and personal statements. However, nonacademic attributes are also considered important in evaluating an applicant's personal qualities, such as commitment, perseverance, leadership, professionalism, and dedication.

Previous studies have recommended that dental schools consider additional criteria beyond GPA, DAT scores, interview rating, and undergraduate major when selecting their students. However, there is no recent literature that describes or quantifies the nonacademic characteristics of the typical dental school applicant.

Applicants analyzed in our study represented 12 percent of the total applicants to U.S. dental schools in 2005.[8] However, it is important to acknowledge that an applicant's decision to apply to a particular dental school program may be influenced by factors such as academic reputation, curricular structure, location, and class size. The UCSDM study population had an average GPA of 3.23 and a DAT Academic Average of 18.6. Of the 1,116 applicants analyzed, 55 percent were male and 45 percent female, with 9 percent underrepresented minorities. These percentages are comparable to data from the 2005 AADSAS feeder report, which reported that, of the 9,379 total applicants, 56 percent were male and 44 percent female, with 11.9 percent underrepresented minorities.[8] Also, in the most recently released national data on academic qualifications, applicants in 2002 had an average GPA of 3.19 and a DAT Academic Average of 18.0.[9]

The majority of UCSDM applicants (91 percent) reported participating in three or four nonacademic areas. Of the remaining applicants, less than 2 percent reported one or no activities. Although men and women had similar academic credentials in terms of GPA, females consistently reported greater participation across all nonacademic areas. In general, it appears that most dental school applicants are active in a variety of nonacademic pursuits.

Applicants are often advised to participate in shadowing or mentoring experiences prior to applying to dental school. As part of their selection factors, many U.S. dental schools expect applicants to demonstrate an understanding of the dental profession and experience in the field of dentistry.[10] When considering shadowing experiences, including total hours and location, it is important to take into account those applicants employed in the dental profession as assistants or hygienists. As a group, auxiliary personnel comprised nearly a quarter of the

Table 6. Racial and ethnic groups: non-dental assistant or dental hygienist applicants

	White	Asian	Black	Hispanic
Applicants	427	283	33	34
% Shadowing	89%	83%	76%	74%
Shadowing Hours	190	219	93	252
Extracurricular Activities	3.7	3.7	4.8	3.6
Volunteer Experiences	3.2	3.0	2.8	2.8
Research Projects	0.8	0.9	0.8	0.8
Parent Dentist	13%	10%	0%	24%
Total GPA	3.34	3.15	3.17	3.23
Total Science GPA	3.25	3.04	3.04	3.14
DAT Academic Average	18.7	19.4	17.7	18.3
DAT Total Science	18.6	19.2	17.9	18.2

applicant pool and reported thirteen times the number of shadowing hours than the remainder of the applicants. Auxiliary personnel were also more likely to have experience in multiple office settings. A reason for the high proportion of auxiliary personnel may include the desire to demonstrate a commitment to the dental profession by gaining experience in an office setting. Also, employment as a dental assistant or hygienist may serve as a strong motivator of the decision to apply to dental school.

Involvement in extracurricular activities can be reflective of an applicant's nonacademic interests, leadership potential, and long-term commitment. In this study, the average dental school applicant participated in three or four extracurricular activities, while some listed more than twenty. Frequently reported activities included participation in music or dance programs and multicultural groups, which were categorized as arts and culture. Many students also participated in activities related to the university community, including membership in the student government, work as a community or resident assistant, or service as a campus orientation leader.

Participation in volunteer initiatives can be an important indicator of social awareness, interpersonal skills, and dedication to the community or humanity. The typical applicant participated in three different volunteer programs, while 6 percent did no volunteering and 22 percent reported five or more experiences. Some common community service programs listed by applicants related to health service, including participation in Red Cross blood drives, hospital or medical office visits, and various sponsored walk or run events (March of Dimes, American Cancer Society, Muscular Dystrophy Foundation, etc.). Examples of education and mentoring experiences included tutoring elementary, middle, and high school students and counseling at the Boys and Girls Club or summer camps.

Research can be indicative of a desire to advance knowledge and an appreciation for scientific inquiry. Though research was reported by only half of the applicant pool, some applicants reported up to nine different projects. Most of the investigations reported by applicants focused on biology and involved health-related research, such as studies on cancers, teen smoking, or hearing loss; non-health-related research, commonly in the fields of entomology or ecology; and dental-specific research, including cariology, periodontitis, and technological advances.

Results from this study indicate that applicant participation levels in three of the nonacademic areas are correlated. This suggests that the same applicants tend to be the most active in extracurricular, volunteer, and research pursuits, but not necessarily in shadowing hours. It also appears that the best academically qualified applicants tended to have fewer shadowing hours but average or better than average levels of participation in the other nonacademic areas. It is interesting to note that applicants with high shadowing hours tended to have poorer academic records. Reasons to account for this relationship may be that: 1) those with the highest shadowing hours (assistants or hygienists) have lower average GPAs; 2) applicants with a less competitive academic record try to compensate by increasing their shadowing hours; or 3) applicants focus on attaining extensive shadowing experiences at the expense of academics.

Study results suggest that there may be some significant differences in the nonacademic profiles among major racial and ethnic groups. For example, Hispanic applicants reported the greatest number of shadowing hours and blacks the least. This result may be attributable to the fact that Hispanic applicants also reported the greatest percentage of parents as a dentist, while blacks reported the fewest. Blacks reported the greatest average number of extracurricular activities when compared to the other three groups. The small sample size of Hispanics and blacks in this study may limit the interpretation of these results, but the potential differences observed suggest that future studies may be warranted.

Conclusion

Results from this study suggest that the average applicant participates in three or four major nonacademic areas. The typical applicant reported a combined total of approximately eight extracurricular, volunteer, and research endeavors and 170 or more hours of shadowing. Participation in nonacademic areas was correlated, with the exception of shadowing, as an increase in any one area resulted in similar increases in the other two. However, shadowing hours were negatively correlated with average GPA. In general, women were more active across all of the nonacademic areas than were men. Differences were also noted between racial and ethnic groups in terms of shadowing hours, numbers of nonacademic activities, and academic credentials.

It is not unusual for potential dental school applicants to question career counselors, dental admissions staff, and dental professionals about the types of

selection factors that dental schools consider. In order to be competitive, applicants should be advised to participate in a broad range of experiences that highlight their commitment to the profession, devotion to society, and desire for personal growth. Results of this study can assist admissions committees in making qualitative comparisons between applicants with similar academic qualifications and aid health career counselors in advising predental students.

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Dental School Applicants by State Compared to Population and Dentist Workforce Distribution

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Abstract: Millions of Americans face significant barriers that limit their access to oral health care, including the lack of dental health care professionals willing to provide dental services in underserved areas. The purpose of this study was to evaluate the relationship between the geographic distribution of dental school applicants and the population and number of dentists by state. Data from the Associated American Dental Schools Application Service (AADSAS), the American Dental Association (ADA), the U.S. Census Bureau, and the U.S. Department of Commerce were used to determine the total number of dental school applicants, dentists, and populations by individual state. Results suggest that, based on national averages, the majority of states may have too few dentists to meet current and future state population needs. Also, many of these same states may have too few dental school applicants when compared to state population and dental workforce figures. It was concluded that states may wish to consider targeted initiatives aimed at increasing the sizes of their dental school applicant pools in order to help address current and future local or regional dental workforce needs.

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Key words: dental workforce, dental school applicants, access to care, geographic distribution

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Millions of Americans face significant barriers that limit their access to oral health care. One of the major obstacles faced by underserved populations is the distribution and size of the dental workforce. According to a 2002 article by Beazoglou et al.,[1] the influences on dental workforce requirements are multifaceted, including productivity, demand for services, the economy, socioeconomic shifts, changes in therapeutic and prevention interventions, oral disease rates, dental fees, the use of allied personnel, and new technologies. While tending to focus on the governing factors of supply and demand, these authors acknowledge that there are large segments of the population that do not receive adequate oral health care. Other factors, such as the aging of dental practitioners and shifts in gender, racial, and ethnic diversity, may also influence the dental workforce.[2]

Economic or market-based approaches to assessing the adequacy of the dental workforce may be insufficient given that there are unmet oral health care needs in populations with low income, lack of insurance coverage, and geographic or institutional barriers that prevent them from demanding care.[2] In 2002, about 63 percent of Americans overall and less than 50 percent of the poor visited a dentist in the past year.[3] America's problems in accessing oral health care have been attributed to the lack of dental health professionals in many areas of the country.[4]

Previous studies have compared dental school enrollees and graduates to state population and dentist workforce demographics.[5,6] However, a major challenge faced by the dental profession is to ensure that there is a sufficient number of qualified dental school applicants who are not only interested in meeting the economic demand for services, but are also dedicated to addressing the oral health needs of populations with limited access to care. The purpose of this study was to evaluate the relationship among the number of dental school applicants, population, and dentists by state in the hopes of better understanding the factors that may influence the distribution of the dental workforce.

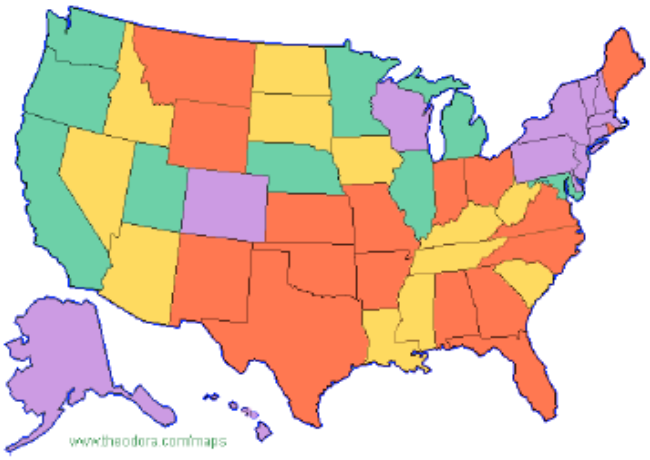
Methods

The number of dental school applicants by state of residence for the 2005–06 admissions cycle was obtained from the Associated American Dental Schools Application Service (AADSAS) and from the American Dental Education Association (ADEA) for non-AADSAS dental schools located in Georgia,

Louisiana, Mississippi, Tennessee, and Texas.[6] Data concerning the number of practicing dentists by state were obtained from a report issued by the American Dental Association (ADA) Survey Center for 2003.[7] State population data for 2005 were obtained from the U.S. Census Bureau.[8]

A national average dentist to population ratio, applicant to population ratio, and applicant to dentist ratio were generated and used as a baseline for comparing individual states. States were ranked relative to one another; and the top five states in terms of number of applicants, dentist to population ratios, applicant to population ratios, and applicant to dentist ratios were determined.

States were divided into one of four categories based on applicant to population and dentist to population ratios in comparison to national averages as described in Figure 1. For each state dental workforce, the number of dentists above or below the national average dentist to population ratio was



National Average Overall Ratios

Applicant per Population: 1 to 29,895 People
Dentist per Population: 1 to 1,851 People

State Category Designations

Category 1
Both state ratios are at or better than the national averages

Category 2
Dentist to state population ratio is at or better than the national average; applicant to state population ratio is worse than the national average

Category 3
Applicant to state population ratio is at or better than the national average; dentist to state population ratio is worse than the national average

Category 4
Both state ratios are worse than the national averages

Figure 1. Geographic comparisons of dental school applicant and dentist to state population ratios

determined. The relationships between applicants and dentists, applicants or dentists and population, and applicants or dentists and number of dental schools were determined.

Data were analyzed using basic descriptive and inferential statistics in the Statistical Package for the Social Sciences (SPSS) program.

Results

In 2005–06, there was a combined total of 9,915 applicants to U.S. dental schools. Table 1 contains a comprehensive list of each state's number of dental school applicants, applicants to state population ratio, and applicants to dentist ratio. The table also identifies the thirty-four states that have one or more dental schools. Of the remaining sixteen states, all but one (Delaware) have some type of articulation agreement with an out-of-state dental school.[5]

Table 2 compares those states having the greatest and fewest dental school applicants and the best and worst applicant to dentist, applicant to state population, and dentist to state population ratios. States with the greatest number of applicants were California, Texas, and New York, while Vermont, Rhode Island, and Maine had the fewest total applicants. When compared to the number of dentists in a particular state, North Dakota, Utah, Idaho, and Nevada had the most favorable dental school applicant to practicing dentist ratios. The least favorable ratios are found in Vermont, Hawaii, and Rhode Island. Nationally, the applicant to dentist ratio was about 1 to 16.2 or 9,915 applicants to 160,623 dental practitioners.

When taking state total population into account, Utah has the best ratio of one dental school applicant for every 7,506 people in the state. In Vermont, this ratio is 1 to 103,842, while nationally it is about 1 to 29,895. The practicing dentist to state population ratio for the country is 1 to 1,851. For Massachusetts, this ratio was better than all other states (1 to 1,334), while Mississippi had the least favorable ratio (1 to 2,839). It is interesting to note that none of the states with the fewest number of applicants have a dental school. Also, of states with the worst applicant to dentist ratios, only one of five states has a dental school (Table 2).

Results in Table 3 show that strong positive correlations ($p<0.01$) exist between a state's total number of dental school applicants and total population ($r=0.958$), number of dentists and population ($r=0.752$), and number of applicants and dentists ($r=0.934$). There is also a significant relationship ($p<0.01$) between the number of applicants or dentists in a state and the presence of one or more dental schools ($r=0.794$ and $r=0.865$, respectively).

Nine states had dentist to population and applicant to population ratios better than the national average (Category 1), while for seventeen states both ratios were worse (Category 4). Twelve Category 2 states had a better dentist to population ratio and a worse applicant to population ratio than national averages, while twelve Category 3 states had a better applicant to population ratio and a worse dentist to population ratio (Figure 1).

Discussion

Results show that highly populated states produce more applicants and have more dentists than less populous states. However, when considering the adequacy of a state's dental workforce or dental school applicant pool, it is more useful to relate these demographics to the state population. Our results show that states such as Mississippi, Nevada, New Mexico, and North Carolina have the poorest dentist to state population ratios. Similar results were reported by the National Institute of Dental and Craniofacial Research of the National Institutes of Health, which also noted that many of these same states with workforce deficits have some of the largest underserved populations.[4]

The thirty states with a dentist to population ratio below the national average also produced fewer than half of the dental school applicants in 2005–06, suggesting that such areas will be producing fewer new dentists that claim legal residency in these states. According to *The Economics of Dental Education,* the geographic variance in the dental workforce is a direct consequence of the rate at which young people from a given area attend dental school.[9] Furthermore, the most likely site for a dentist to begin practice is the community or region in which he or she was raised or attended school.[9,10] This concept provides the foundation for state- or county-specific strategies to enhance and maintain their dental workforce, potentially aimed at the dental school education system and the quality and quantity of the dental school applicant pool.

States with relatively few dentists and few applicants are most in need of tactics to improve future access to care. Without intervention, these states may

Table 1. 2005–06 dental school applicants compared to population and dentist workforce by state

State	DS or AA+	Applicants (AP)	AP:State Population*	AP:Dentists*
AL	DS	108	42,202	16.9
AK	AA	19	34,930	20.2
AZ	DS	241	24,644	10.0
AR	AA	90	30,879	11.9
CA	DS	1,385	26,088	17.1
CO	DS	133	35,077	20.6
CT	DS	60	58,505	41.0
DE	–	21	40,168	16.4
FL	DS	503	35,368	16.0
GA	DS	282	32,172	12.3
HI	AA	19	67,115	48.8
ID	AA	108	13,232	6.7
IL	DS	441	28,942	17.6
IN	DS	208	30,154	13.5
IA	DS	121	24,515	11.8
KS	AA	67	40,965	19.5
KY	DS	201	20,763	10.3
LA	DS	169	26,767	11.6
ME	AA	15	88,100	38.7
MD	DS	197	28,428	18.7
MA	DS	129	49,603	37.2
MI	DS	347	29,167	16.6
MN	DS	173	29,669	16.1
MS	DS	118	24,755	8.7
MO	DS	159	36,480	16.2
MT	AA	31	30,183	14.9
NE	DS	104	16,911	9.5
NV	DS	128	18,866	6.7
NH	AA	17	77,055	42.8
NJ	DS	274	31,817	23.6
NM	AA	43	44,846	16.7
NY	DS	509	37,828	27.7
NC	DS	263	33,016	12.5
ND	AA	66	9,647	4.3
OH	DS	264	43,424	21.6
OK	DS	174	20,390	8.9
OR	DS	180	20,228	12.0
PA	DS	259	47,991	28.9
RI	AA	12	89,682	46.2
SC	DS	154	27,630	11.3
SD	AA	31	25,030	10.6
TN	DS	224	26,620	12.4
TX	DS	761	30,039	12.2
UT	AA	329	7,506	4.5
VT	AA	6	103,843	58.5
VA	DS	253	29,911	14.8
WA	DS	273	23,032	14.0
WV	DS	69	26,331	10.7
WI	DS	150	36,908	20.1
WY	AA	17	29,958	14.7

+The presence of one or more dental schools (DS) or articulation agreements (AA) with an out-of-state dental school. *Source:* Byck GR, Kaste LM, Cooksey JA, Chou CF. Dental student enrollment and graduation: a report by state, census division, and region. J Dent Educ 2006;70(10):123–37.

*Ratios reported as 1 to the listed number.

Table 2. Variations in dental school applicants, populations, and dentists by state compared to national averages

		Greatest		Fewest
Total Number of Applicants	CA	1,385	NH	17
	TX	761	WY	17
	NY	509	ME	15
National Total	FL	441	RI	12
9,915	IL	347	VT	6
		Best*		Worst*
Applicant to Dentist Ratio	ND	4.3	CT	41.0
	UT	4.5	NH	42.8
National Ratio	ID	6.7	RI	46.2
1 to 16.2	NV	6.7	HI	48.8
	MS	8.7	VT	58.5
Applicant to State Population Ratio	UT	7,506	HI	67,115
	ND	9,647	NH	77,055
National Ratio	ID	13,232	ME	88,100
1 to 29,895	NE	16,911	RI	89,682
	NV	18,866	VT	103,842
Dentist to State Population Ratio	MA	1,334	GA	2,608
	NJ	1,347	NC	2,644
National Ratio	NY	1,368	NM	2,690
1 to 1,851	HI	1,376	NV	2,824
	CT	1,427	MS	2,839

*Ratios are reported as 1 to the listed number.

Table 3. Correlation of state dental applicants and demographic variables

Demographic Variables	r Value	Significance
Number of Applicants to Population	0.958	0.01
Number of Dentists to Population	0.752	0.01
Number of Applicants to Number of Dentists	0.934	0.01
Number of Applicants to Number of Dental Schools	0.794	0.01
Number of Dentists to Number of Dental Schools	0.865	0.01

continue to lose dentists as the current workforce matures and retires without replacement. An important strategy to consider may be to increase the number of their potential dental school applicants, assuming that this might translate into an increased number of local dentists in future years. One way to achieve this goal is to foster an interest in the profession at the state collegiate[11] and high school levels, perhaps in a coordinated effort to organize predental societies,[12] provide shadowing experiences, and assist students in becoming qualified and competitive dental school applicants.[13] By working closely with state colleges and universities to promote careers in dentistry, a valuable pipeline can be established.[11] States may also wish to consider or continue programs that offer loan or tuition reimbursement to help ensure that recent dental school graduates return to their home state when establishing a practice or to attract new dentists from other areas.[14]

Nationally, the presence of a dental school is significantly correlated with the number of dental school applicants and dentists in a state. Along with working to cultivate a greater interest in the profession among college undergraduates, states that are

fortunate enough to have a dental school can better their dentist to population ratios by increasing the number of accepted dental students from their state. Similarly, to provide a means for state residents to enter the dental profession, most states that lack a dental school have formed some type of agreement with a dental program in another state.[5]

Initiatives to increase the number of dental school applicants and retain them after graduation may also be useful for all states, as a successful dentist to population ratio does not necessarily ensure the adequate distribution of a state's workforce. Every state has populations that remain underserved and should consider efforts to target the distribution of dental professionals to those in need. Potential strategies to address this issue include the recruitment of dental applicants from areas that lack access to oral health care, such as rural and geographically isolated locations and urban centers with large diverse populations. Another approach that has been suggested involves subsidizing the income of dentists who establish practices in rural or underserved areas.[2] Additionally, states may wish to facilitate the travel of existing providers to counties and areas that do not have a dentist.

Conclusion

In order for states to develop strategies to provide optimum oral health care to all residents, a geographical comparison of the dental workforce and dental school applicant pool may be valuable. Based on national averages, the majority of states may have too few dentists to meet current and future state population needs. Many of these same states may also have too few dental school applicants when compared to state population and state dental workforce figures. These states may wish to consider targeted initiatives aimed at increasing the sizes of their applicant pools in order to address local and regional oral health care provider shortages.

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